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Children at Risk for Suicide Attempt and Attempt-related Injuries: Findings from the 2007 Youth Risk Behavior Survey

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Purpose: The current study examines the associations between a range of risk factors and reports of suicide attempts and attempts requiring medical care in a nationally representative study of high school students. The goal is to examine sex differences in the risk factors associated with suicide attempts and attempt-related injuries requiring treatment by a health-care provider.

Methods: We used data from the 2007 Youth Risk Behavior Survey for students in grades 9-12 to assess the prevalence and risk factors for suicidal behavior, as well as differences in these for boys and girls. Cross-sectional multivariate logistic regression analyses were computed to determine the most important risk factors for suicide attempts and for suicide attempts requiring medical care for the sample overall and also stratified for boys and for girls.

Results: Overall, 6.9% of adolescents attempted suicide (9.3% of girls versus 4.6% of boys). Girls were more likely than boys to report a suicide attempt in the past year (Adj.OR=2.89). Among girls, sadness (Adj.OR=5.74), weapon carrying (Adj.OR=1.48), dating violence (Adj.OR=1.60), forced sex (Adj.OR=1.72), and huffing glue (Adj.OR=2.04) were significantly associated with suicide attempts. Among boys, sadness (Adj.OR=10.96), weapon carrying (Adj.OR=1.66), forced sex (Adj.OR=2.60), huffing glue (OR=1.63), hard drug use (Adj.OR=2.18), and sports involvement (Adj.OR=1.52) were significantly associated with suicide attempts.

Conclusion: These findings demonstrate similarities and differences in the modifiable risk factors that increase risk for suicide attempts among boys and girls. In terms of the differences between boys and girls, hard drug use and sports involvement may be important factors for suicide-prevention strategies directed specifically towards boys, while dating violence victimization may be an important risk factor to address for girls. Overall, these findings can help guide prevention, clinical practice, and intervention strategies to prevent suicidal behaviors among adolescents. [West J Emerg Med. 2010; 11(3):257-263.]

INTRODUCTION

Youth suicide is an increasingly important public health issue in the U.S. that impacts many adolescents, their families and communities.¹⁻⁹ In 2006 suicide was the third leading cause of death among youth 10-24 years of age.² Research shows that 8.4% (10.8% for girls and 6.0% for boys) of high school students in the U.S. reported attempting suicide in the past year.¹⁰ Several well known risk factors exist for suicidal behavior among youth.^{1,3-9} These include depression,

impulsive and aggressive behaviors, previous victimization, social isolation, alcohol and drug use, sexual activity, and family factors. Previous studies show that several of these risk factors vary by sex.^{1,8-9,11-25} However, considerable gaps still remain in understanding the extent to which these suicide risks vary by sex, particularly among nationally representative youth. More specific knowledge is needed to direct future youth suicide-prevention strategies and to decide how limited resources can be best dispersed.

The purpose of the current study is to examine the associations between a range of risk factors and reports of suicide attempts and attempts requiring medical care in a nationally representative study of high school students. The selected and modifiable risk factors have been identified as important in previous empirical and theoretical research including the developmental–transactional model of youth suicidal behaviors⁶ and will be examined separately for boys and girls since the prevalence of both the risk factors and the outcome often varies by sex.^{1,7,8,11,16,21,26} Moreover, focusing specifically on modifiable risk factors will ensure that information from the current study can inform future prevention strategies, clinical practice and resource allocation.

METHODS

Analyses are based on cross-sectional data from the 2007 Youth Risk Behavior Survey (YRBS), which includes a nationally representative sample (n=14,041) of high school students in grades 9-12. Details of the survey have been

reported elsewhere.²⁷⁻²⁸ The overall response rate for the study was 68%. Students voluntarily completed the anonymous, self-administered questionnaire in school following local parental permission procedures. The data are weighted to be representative of high school students in the U.S. IRB approval was obtained at Georgia State University to conduct these secondary data analyses.

Table 1 presents the 14 psychosocial variables examined in our analysis. All of these factors were di/trichotomized and have been described elsewhere.²⁷⁻²⁸

Two outcome variables were examined: 1) “During the past 12 months, how many times did you actually attempt suicide?” (suicide attempt); 2) “If you attempted suicide during the past 12 months, did any attempt result in an injury, poisoning, or overdose that had to be treated by a doctor or nurse?” (suicide attempt requiring medical care). Both outcome variables were dichotomized into ‘No’ vs. ‘Any’ for all analyses. Associations between all previously listed risk factors and both of these outcome variables were examined separately.

Table 1. Prevalence and wording of the psychosocial factors included in the analyses.

Variable	Wording of Question	Prevalence
Sadness	Percentage of students who felt so sad or hopeless almost every day for two weeks or more in a row that they stopped doing some usual activities during the past 12 months.	28.5%
Weapon Carrying	Percentage of students who carried a weapon such as a gun, knife, or club on one or more of the past 30 days.	18.0%
Physical Fighting	Percentage of students who were in a physical fight one or more times during the past 12 months.	35.5%
Alcohol Initiation	Percentage of students who had their first drink of alcohol other than a few sips before age 13 years.	23.8%
Binge Drinking	Percentage of students who had five or more drinks of alcohol in a row, that is, within a couple of hours, on one or more of the past 30 days.	26.0%
Monthly Drinking	Percentage of students who had at least one drink of alcohol on one or more of the past 30 days.	44.7%
Marijuana Use	Percentage of students who used marijuana one or more times during their life.	38.1%
Hard Drug Use	Percentage of students who used any form of cocaine, including powder, crack, or freebase, heroin, methamphetamines, ecstasy, or steroids one or more times during their life.	11.8%
Glue Huffing	Percentage of students who sniffed glue, breathed the contents of aerosol spray cans, or inhaled any paints or sprays to get high one or more times during their life.	13.3%
Number of Sexual Partners	Percentage of students who had sexual intercourse with three or more people during their life.	20.3%
Sports Involvement	Percentage of students who played on one or more sports teams run by school or other organizations in the past 12 months.	56.2%
Change Body Image	Percentage of students who are trying to change their weight by either gaining or losing weight.	61.7%
Dating Violence Victimization	Percent of students who were ever hit, slapped, or physically hurt on purpose by their boyfriend or girlfriend during the past 12 months.	9.9%
Forced Sex	Percentage of students who had ever been physically forced to have sexual intercourse when they did not want to.	7.8%

Table 2. Demographic and psychosocial correlates of suicidal attempt among U.S. high school students, 2007

	Suicide Attempters		Girls (Attempters)		Boys (Attempters)	
	%	OR _{adj} ¹ (95%CI)	%	OR _{adj} ² (95%CI)	%	OR _{adj} ² (95%CI)
Grade						
9 th	32.6	1.67 (1.28, 2.19)**	32.1	1.86 (1.30, 2.67)*	33.6	1.40 (0.92, 2.12)
10 th	30.9	1.60 (1.10, 2.34)**	32.1	1.83 (1.17, 2.86)*	28.2	1.35 (0.83, 2.19)
11 th	19.8	1.23 (0.92, 1.66)	20.4	1.27 (0.89, 1.82)	18.8	1.24 (0.76, 2.02)
12 th	16.7	1.00	15.4	1.00	19.4	1.00
Race						
Black	15.4	1.29 (0.90, 1.84)	14.7	1.23 (0.81, 1.87)	17.0	1.43 (0.84, 2.44)
Hispanic	10.4	1.65 (1.22, 2.23)**	10.2	1.65 (1.12, 2.43)*	10.9	1.63 (1.02, 2.61)*
Other	23.3	1.66 (1.25, 2.22)**	23.1	1.63 (1.17, 2.28)*	23.9	1.93 (1.19, 3.11)*
White	50.8	1.00	52.1	1.00	48.1	1.00
Alcohol Initiation						
After 13	45.3	1.08 (0.75, 1.57)	48.5	1.08 (0.67, 1.75)	38.6	1.12 (0.61, 2.05)
13 or Before	44.0	1.36 (0.99, 1.89)	41.0	1.47 (0.92, 2.35)	50.5	1.25 (0.59, 2.67)
None	10.7	1.00	10.6	1.00	10.9	1.00
Monthly Drinking						
Yes	42.7	1.00 (0.73, 1.37)	39.7	1.01 (0.71, 1.45)	49.9	0.91 (0.57, 1.46)
No	57.3	1.00	60.3	1.00	50.1	1.00
Binge Drinking						
Yes	48.1	1.44 (1.03, 2.01)*	45.7	1.45 (0.99, 2.11)	53.7	1.39 (0.78, 2.49)
No	51.9	1.00	54.3	1.00	46.3	1.00
Hard Drug Use						
Yes	37.7	1.45 (1.02, 2.06)*	32.4	1.18 (0.77, 1.81)	48.6	2.18 (1.24, 3.84)**
No	62.3	1.00	67.6	1.00	51.4	1.00
Glue/Huffing						
Yes	38.7	1.93 (1.54, 2.42)***	38.2	2.04 (1.56, 2.67)***	39.6	1.63 (1.08, 2.47)*
No	61.3	1.00	61.8	1.00	60.4	1.00
Marijuana Use						
Yes	51.9	1.17 (0.83, 1.64)	47.9	1.26 (0.85, 1.87)	60.4	1.03 (0.61, 1.73)
No	48.1	1.00	52.1	1.00	39.6	1.00
Weapon Carrying						
Yes	33.2	1.53 (1.21, 1.95)***	20.6	1.48 (1.07, 2.07)*	61.0	1.66 (1.00, 2.77)*
No	66.8	1.00	79.4	1.00	39.0	1.00
Physical Fighting						
Yes	40.7	1.32 (1.00, 1.76)	32.7	1.27 (0.89, 1.81)	57.9	1.50 (0.86, 2.60)
No	59.3	1.00	67.3	1.00	42.1	1.00
Dating Violence Victimization						
Yes	24.7	1.51 (1.14, 1.99)**	22.6	1.60 (1.06, 2.41)*	29.0	1.25 (0.84, 1.86)
No	75.3	1.00	77.4	1.00	71.0	1.00
Forced Sex						
Yes	29.1	1.84 (1.30, 2.59)***	31.4	1.72 (1.20, 2.47)**	24.6	2.60 (1.19, 5.70)*
No	70.9	1.00	68.6	1.00	75.4	1.00
Number of Sex Partners						
1/2	28.4	1.03 (0.73, 1.45)	29.5	1.01 (0.68, 1.51)	26.0	1.20 (0.83, 1.72)
3+	42.2	1.28 (0.96, 1.70)	38.1	1.51 (1.06, 2.16)	51.6	1.00 (0.60, 1.65)
No	29.4	1.00	32.5	1.00	22.4	1.00
Change Body Image						
Yes	72.6	1.09 (0.82, 1.45)	76.9	1.33 (0.95, 1.87)	63.7	0.76 (0.50, 1.17)
No	27.4	1.00	23.1	1.00	36.3	1.00
Sports Involvement						
Yes	51.2	1.05 (0.84, 1.32)	54.6	0.89 (0.70, 1.14)	43.9	1.52 (1.07, 2.16)*
No	48.8	1.00	45.4	1.00	56.1	1.00
Sadness						
Yes	77.5	7.13 (5.44, 9.35)***	79.5	5.74 (4.08, 8.07)***	73.4	10.96 (6.87, 17.49)***
No	22.5	1.00	20.5	1.00	26.6	1.00

Adj, fully adjusted for all variables listed. * p < 0.05, ** p < 0.01, *** p < 0.001

Data Analysis

We computed prevalence estimates and multivariate logistic regression analyses with the SPSS (v 15.0) complex survey procedure to account for the complex sampling design. Odds Ratios (OR) were computed to evaluate the strength of the associations, and statistical significant levels were determined based on both $p < 0.05$ and 95% confidence intervals (CIs) that did not include 1.

RESULTS

In 2007, 6.9% of high school students reported attempting suicide, and 2.0% reported a suicide attempt that required medical care. The prevalence and associations between demographic and other characteristics and suicide attempts is presented in Table 2. Overall, sadness, binge drinking, huffing glue, hard drug use, weapon-carrying, dating violence victimization, and forced sex were associated with attempting suicide. For girls, being in a younger grade, being of 'other' minority race or Hispanic ethnicity, sadness, huffing glue, weapon-carrying, dating violence victimization, and forced sex were significantly associated with suicide attempts. Similarly, for boys, sadness, hard drug use, glue huffing, weapon-carrying, forced sex, and sports involvement were significantly associated with suicide attempts.

Associations between risk factors and suicide attempts requiring medical care are presented in Table 3. In these analyses, sadness and binge drinking were significantly associated with suicide attempts requiring medical care. Stratified analyses by sex show that for girls, sadness and having sex with more than two partners were significantly associated with suicide attempts requiring medical care. However, for boys, none of these risk factors were found to be significantly associated with suicide attempts requiring medical care.

DISCUSSION

This study examined the risk behaviors associated with suicide attempts and suicide attempts requiring medical care among high school students in the U.S. using recent national data. Four important findings need to be highlighted. First, the findings confirm previous research that have identified important risk factors for suicidal behaviors among youth.^{1,3-9,11-25} In particular, the current findings show that sadness, substance use, and violent victimization were among the most important risk factors for suicide attempts among both girls and boys. Second, this study did not find significant associations, for boys or girls, between early alcohol use initiation, monthly drinking, or binge drinking and suicide attempts which have been observed in previous research.^{8,24} This finding is intriguing and warrants further analyses and replication. Third, this study demonstrates that there is a range of factors contributing to suicide attempts, among both boys and girls. However, in analyses specifically of those adolescents who had attempted suicide and required medical

care, few risk factors were statistically important. This finding underscores the importance for future research to consider more proximal situational and contextual factors to determine risk for injury specifically. Finally, the study highlights important sex differences in the risk factors that are important for both suicide attempts and for attempts requiring medical care. These findings need to be considered in future research, as well as in clinical practice, especially for the emergency departments (ED) where adolescent may seek care. Research shows that a suicide attempt is the strongest predictor for a future attempt and completed suicide.²⁹⁻³¹ Therefore, appropriate clinical intervention at the time of seeking care in the ED that is designed to reduce future attempts and injuries will be needed. Moreover, researchers also must consider the need to develop and implement potentially sex-specific prevention strategies directed towards boys and girls, separately.

Overall, these findings highlight that sadness, substance use and violent victimization remain critically important factors for suicidal behaviors and should be a priority for prevention efforts. Although the study did not specifically assess health utilization or service provision, the relatively high prevalence of these risk factors examined appear to indicate high levels of unmet health needs and the importance of providing more health services to youth. Unfortunately, mental health treatment and related services are typically underfunded at all levels of government.^{32,33} However, these strategies need to be reconsidered within the context of adolescent health promotion and suicide prevention.

The findings also highlight that younger girls are at increased risk for suicide attempts, which may be due to transitions within adolescence as well as pubertal development. Previous research has shown that younger girls are more likely to engage in suicidal behaviors than younger boys, implicating the hormonal changes that girls undergo during puberty as the cause of this phenomenon.³⁴

LIMITATIONS

Several limitations should be considered when interpreting the findings of this study. First, it is based on students who are attending school; therefore, the findings may not be generalizable to students who no longer attend school. Second, the data were self reported and may reflect biases and misreporting. Third, while the study included a very large sample that was also weighted to be nationally representative, the overall response rate for the survey was a relatively low 68% which may also have impacted the findings. Fourth, because of the cross-sectional survey design, the temporal ordering or any causality between the risk factors and outcome variables could not be determined. Fifth, the measures used were given equal weight and based on single indicators, not a comprehensive scale, which may further have impacted the findings. Sixth, the risk factors examined reflected different time frames, which may have also impacted

Table 3. Demographic and psychosocial correlates of suicidal attempt requiring medical care among U.S. high school students, 2007

	Injured Suicide Attempters		Girls (Injured Attempters)		Boys (Injured Attempters)	
	%	OR _{adj} ¹ (95%CI)	%	OR _{adj} ² (95%CI)	%	OR _{adj} ² (95%CI)
Grade						
9 th	33.9	0.86 (0.53, 1.38)	31.6	1.24 (0.64, 2.43)	37.5	0.58 (0.20, 1.68)
10 th	28.4	0.78 (0.40, 1.49)	34.0	0.88 (0.37, 2.07)	19.2	0.43 (0.10, 1.78)
11 th	19.4	0.79 (0.44, 1.41)	17.7	0.78 (0.39, 1.52)	22.3	0.97 (0.39, 2.40)
12 th	18.3	1.00	16.7	1.00	21.1	1.00
Race						
Black	16.5	0.92 (0.43, 1.96)	11.9	0.77 (0.27, 2.16)	24.6	1.62 (0.49, 5.35)
Hispanic	8.2	0.75 (0.43, 1.32)	6.9	0.62 (0.27, 1.44)	10.4	1.39 (0.40, 4.83)
Other	26.0	1.09 (0.65, 1.80)	26.6	0.89 (0.45, 1.77)	25.0	1.38 (0.44, 4.34)
White	49.3	1.00	54.6	1.00	40.1	1.00
Alcohol Initiation						
After 13	41.2	0.73 (0.29, 1.83)	46.8	1.29 (0.40, 4.17)	31.0	0.27 (0.5, 1.56)
13 or Before	52.2	0.67 (0.28, 1.65)	49.2	1.33 (0.46, 3.86)	57.6	0.16 (0.02, 1.16)
None	6.6	1.00	4.0	1.00	11.4	1.00
Monthly Drinking						
Yes	59.5	1.57 (0.84, 2.96)	58.4	1.58 (0.68, 3.65)	61.5	1.79 (0.41, 7.86)
No	40.5	1.00	41.6	1.00	38.5	1.00
Binge Drinking						
Yes	64.7	1.87 (1.08, 3.24)*	66.4	1.74 (0.87, 3.48)	61.6	1.78 (0.45, 7.06)
No	35.3	1.00	33.6	1.00	38.4	1.00
Hard Drug Use						
Yes	52.0	1.07 (0.54, 2.10)	47.7	1.31 (0.65, 2.64)	59.3	0.86 (0.18, 4.03)
No	48.0	1.00	52.3	1.00	40.7	1.00
Glue/Huffing						
Yes	48.4	1.34 (0.78, 2.31)	50.0	1.50 (0.71, 3.17)	45.7	0.95 (0.35, 2.55)
No	51.6	1.00	50.0	1.00	54.3	1.00
Marijuana Use						
Yes	59.9	0.84 (0.47, 1.50)	57.2	0.84 (0.43, 1.63)	64.7	0.90 (0.31, 2.61)
No	40.1	1.00	42.8	1.00	35.3	1.00
Weapon Carrying						
Yes	40.5	0.97 (0.50, 1.88)	26.2	1.03 (0.51, 2.09)	67.9	1.04 (0.31, 3.57)
No	59.5	1.00	73.8	1.00	32.1	1.00
Physical Fighting						
Yes	49.7	1.03 (0.59, 1.78)	43.7	1.02 (0.54, 1.93)	60.1	1.11 (0.32, 3.92)
No	50.3	1.00	56.3	1.00	39.9	1.00
Dating Violence Victimization						
Yes	35.9	1.19 (0.66, 2.16)	32.7	1.10 (0.54, 2.26)	41.3	1.58 (0.47, 5.24)
No	64.1	1.00	67.3	1.00	58.7	1.00
Forced Sex						
Yes	41.2	1.01 (0.57, 1.80)	38.5	0.69 (0.37, 1.32)	45.7	2.62 (0.89, 7.77)
No	58.8	1.00	61.5	1.00	54.3	1.00
Number of Sex Partners						
1/2	28.8	1.78 (0.98, 3.23)	31.5	2.81 (1.41, 5.62)*	23.7	0.73 (0.16, 3.35)
3+	53.3	1.65 (0.74, 3.67)	50.2	2.60 (1.02, 6.62)*	59.3	0.71 (0.08, 6.70)
No	17.9	1.00	18.3	1.00	17.0	1.00
Change Body Image						
Yes	71.4	0.76 (0.46, 1.23)	75.2	0.71 (0.41, 1.25)	64.8	0.69 (0.29, 1.63)
No	28.6	1.00	24.8	1.00	35.2	1.00
Sports Involvement						
Yes	49.8	0.82 (0.51, 1.32)	52.9	0.69 (0.38, 1.26)	44.4	1.17 (0.46, 2.99)
No	50.2	1.00	47.1	1.00	55.6	1.00
Sadness						
Yes	84.6	2.81 (1.50, 5.25)**	89.0	3.67 (1.68, 8.03)***	77.3	2.81 (0.91, 8.67)
No	15.4	1.00	11.0	1.00	22.7	1.00

Adj, fully adjusted for all variables listed. * p < 0.05, ** p < 0.01, *** p < 0.001

the findings. Seventh, other factors not captured in the current study may also be important for suicide attempts and related injuries and should be considered in future research. Eighth, findings regarding boys who reported a suicide attempt requiring medical care should be interpreted with caution due to the smaller number of boys who actually had an attempt that required medical care (n=114). Finally, the risk factors examined in the current study were dichotomized, which could have further impacted the findings. However, dichotomization has been shown to generate findings that are both easily understandable and do not decrease the strength of association.³⁵

CONCLUSION

These findings provide an updated view based on recent and nationally representative data of the risk factors likely to increase risk for suicide attempt or suicide attempt-related injuries among high school students. Sadness, substance use, and prior victimization were particularly strong risk factors for suicide attempts. However, important differences were noted between boys and girls. These differences should be considered in future research, clinical practice and in the design of future prevention efforts. Although youth suicide mortality has seen a slight decline over the past few years,^{2,14} the current findings suggest that youth suicidal behavior and related injuries remain a significant problem that need renewed resources and prevention efforts.

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